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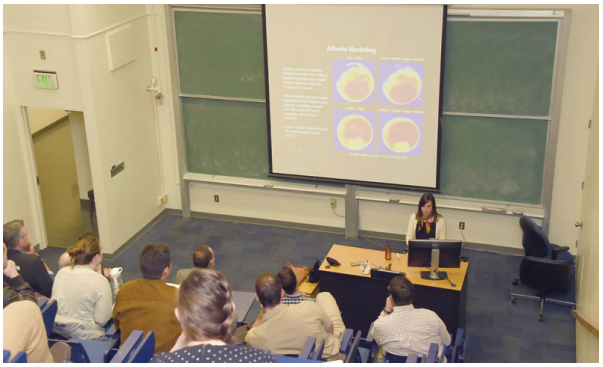

U.S. Navy photo by MC1 Lewis Hunsaker

Space Systems Students Introduced to Celestial Navigation, New Horizons

By MC1 Lewis Hunsaker

Coralie Jackman, Lead Optical Navigation Engineer at KinetX Aerospace, offers a guest lecture on celestial navigation and the New Horizons mission to Pluto to NPS students, staff and faculty in Spanagel Hall, May 18. Jackman has been a member of the New Horizons Navigation Team since 2011, supporting optical navigation development, analysis, planning and operations, and is currently leading optical navigation efforts on the OSIRIS-REx mission to the asteroid Bennu.

"The New Horizons spacecraft was launched on Jan. 16, 2006. We knew about Pluto and Charon, its largest moon, with a distance between them of about a nine to one ratio," said Jackman.

In 2012, through some help with Hubble imaging, two new moons around Pluto were discovered.

"The additional moons posed serious issues in the scope of operations," Jackman said. "Could our aim point be in a debris field? Could there be a ring system that could pose a risk to the spacecraft?"

Due to this new information, the team completed various studies on alternate trajectories and models on how the moons could sweep out debris and if there was a safer place to fly.

"It turns out that our original aim point was one of the safest and least likely regions for debris," added Jackman.

During its travel time, the spacecraft received a gravity assist at Jupiter. "Had we missed this gravity assist and launched two weeks later in the window it would have taken up to four additional years to reach Pluto," Jackman

added.

"In 2014, information about Pluto was limited ... But since the New Horizons satellite flyby of Pluto on July 14, 2015, we now have very high-resolution photos and we never thought it was going to look the way it did."

Photos revealed a variety of things to include ice mountains as high as 11,000 feet; an abundance of methane ice; flowing ice in a manner similar to glaciers on Earth; and, a thin layer of clouds. Over the course of the nine-year travel time, at an average of 14 kilometers per second, the spacecraft arrived only 97 seconds ahead of its scheduled time.

Chair of the NPS Space Systems Academic Group, Dr. James Newman said the lecture was a compelling example of an important topic for SSAG students, faculty.

"We want our students to be exposed to the current state of the art, whether it is near earth or far away. Sometimes ideas aren't necessary attached or immediately obvious in application, but that can stimulate new kinds of thinking. So, a topic about determining where a satellite is, whether it's close or far away like this one, has some applicability," said Newman. "Also, anyone that can navigate to Pluto is worth listening to."

Although New Horizons met its destination in 2015, NASA opted to continue the craft's exploration, with its next mission to explore select Kuiper Belt Objects beyond Pluto in 2019.

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